Министерство науки и высшего образования РФ

Правительство города Севастополя

Федеральное государственное бюджетное учреждение науки
Федеральный исследовательский центр
«Институт биологии южных морей имени А. О. Ковалевского РАН»

Всероссийское гидробиологическое общество при Российской академии наук

Русское географическое общество

Паразитологическое общество при Российской академии наук

Изучение водных и наземных экосистем: история и современность

Международная научная конференция, посвящённая 150-летию Севастопольской биологической станции — Института биологии южных морей имени А. О. Ковалевского и 45-летию НИС «Профессор Водяницкий»

Тезисы докладов

13–18 сентября 2021 г.
Севастополь, Российская Федерация

Севастополь
ФИЦ ИнБЮМ
2021

Flow Cytometry–Measured Cryptophyta Abundance and Biomass in the Bransfield Strait During Austral Summer

Mukhanov V. S.[1], Sakhon E. G.[1], Polukhin A. A.[2], and Artemiev V. A.[2]

[1]A. O. Kovalevsky Institute of Biology of the Southern Seas of RAS, Sevastopol, Russia

[2]Shirshov Institute of Oceanology of the Russian Academy of Sciences, Moscow, Russia

v.s.mukhanov@ibss-ras.ru

Summer phytoplankton blooms in coastal waters of the Antarctic Peninsula are usually associated with a shallow upper mixed layer, that keeps phytoplankton under favorable light conditions and better supply of dissolved iron. As a rule, diatoms and/or haptophytes (predominantly *Phaeocystis antarctica*) make the largest contribution to the blooms, but the role of cryptophytes has been reported to increase sufficiently, especially in water areas of melting glaciers. The mechanisms behind Cryptophyta bloom formation are still poorly understood. In this study, we characterized the nanophytoplankton assemblages by flow cytometry, identify their Cryptophyta component, and analyze their distribution across the Bransfield strait (79th cruise of the RV "Akademik Mstislav Keldysh") in relation to hydrology and hydrochemistry of two major water masses: the warmer and less salty Transitional Zonal Water with Bellingshausen influence (hereinafter TBW) and the cold and salty Transitional Zonal Water with Weddell Sea influence (hereinafter TWW).

Two nanophytoplankton clusters were distinguished and enumerated using a Cytomics^{TM} FC 500 flow cytometry system (Beckman Coulter Inc., USA): larger cells (about 9 µm) of cryptophytes (hereinafter CP) with bright orange fluorescence and smaller (3 µm) other nanophytoplankton (hereinafter NP). In total, 21 biological, hydrological, and hydrochemical variables were measured in the study area and investigated by the methods of multivariate statistical analysis.

The highest Chl *a* fluorescence values were measured at the northern stations of the transect within TBW. Distribution pattern of the total biomass of nanophytoplankton was the same, with a patch of high values at the same stations and depths. This provided evidence that nanophytoplankton were a major, if not dominant, component of phytoplankton in the study area.

In general, CP were significantly less abundant [$(0.35 \pm 0.46) \times 10^6$ cells·L^{-1}; ± SD is presented here and further)] than NP: $(1.71 \pm 1.07) \times 10^6$ cells·L^{-1}. However, their cells were much larger (about 9.5 µm *versus* 3 µm in NP). So, their average carbon biomass (33 ± 45 µg C·L^{-1}) sufficiently exceeded that of NP: (4.3 ± 3.2) µg C·L^{-1}. The Cryptophyta biomass maximum (about 180 µg C·L^{-1}) was observed in TBW in the northern part of the transect. Patches of the highest CP abundances and biomasses were recorded in the photic layer around the jet of the Bransfield Current, while in the TWW (below 1 °C isotherm), CP were scarce or undetectable, especially in the deeper layers. NP demonstrated similar distribution pattern with the highest abundances at 35–50-m depth. The maximum contribution of CP to the total nanophytoplankton biomass was registered farther south in TBW at shallow depths (about 10 m) where NP were not abundant.

According to the results of nMDS and cluster analysis, hydrographic and chemical properties of the strait water masses deeply influenced nanophytoplankton structure, while temperature did not appear to be a key factor controlling NP growth. The data obtained support the idea that the growing meltwater input can potentially increase the spatial and temporal extent of cryptophytes in Antarctic coastal waters. The replacement of large diatoms with small cryptophytes leads to a significant shift in trophic processes in favor of the consumers, like salps, able to graze on smaller prey.

The research was conducted within the framework of the IBSS state assignment No. AAAA-A19-119100290162-0.